

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1-48. (Cancelled).

49. (Withdrawn) A nozzle tip comprising:

a tip retainer comprising a first and a second end region and a central bore extending between said first and said second end regions, said central bore comprising an internally threaded portion disposed proximate said first end region configured to removeably engage with a nozzle housing and an internal annular step extending generally radially inwardly proximate said second end region, wherein a distal most end face of said second end region is substantially radially planar;

a tip insert axially received in said central bore of said tip retainer, said tip insert further comprising a tip channel, at least one outlet aperture in fluid communication with said tip channel, and an external annular step extending generally radially outwardly from an exterior surface of said tip insert that substantially abuts against said internal annular step of said tip retainer, wherein said internal annular step and said external annular step comprise a stop shoulder that limits axial movement of said tip insert from said first end region towards said second end region of said tip retainer;

a seal ring comprising a third end region having a distal most substantially radially planar end face and a fourth end region configured to seal against at least a portion of a mold, wherein said seal ring comprises a material having a lower thermal conductivity than said tip retainer; and

a substantially radially planar weld junction disposed between said distal most substantially radially planar end faces of said tip retainer and said seal ring.

50. (Withdrawn) The nozzle tip of claim 49 wherein said tip insert further comprises a shank portion and an end portion, wherein said external annular step extends generally radially outwardly from an exterior surface of said shank portion.

51. (Withdrawn) The nozzle tip of claim 50 wherein said shank portion comprises a material having a high thermal conductivity and said end portion comprises a material having a high wear-resistance.

52. (Withdrawn) The nozzle tip of claim 51 wherein said shank portion comprises a copper alloy and said end portion comprises a carbide alloy.

53. (Withdrawn) The nozzle tip of claim 49 wherein said fourth end region of said seal ring further comprises a generally frustoconical exterior surface having a minimum diameter proximate said third end region and a maximum diameter proximate a distal most end of said fourth end region.

54. (Withdrawn) The nozzle tip of claim 49 wherein an exterior surface of said second and said third end regions proximate said substantially radially planar weld junction comprise outer perimeters that substantially correspond to each other.

55. (Withdrawn) The nozzle tip of claim 54 wherein said exterior surface of said tip retainer further comprises a circumferential groove disposed proximate said second end region and a heater disposed about at least a

portion of said exterior surface of said tip retainer and within said circumferential groove.

56. (Withdrawn) The nozzle tip of claim 54 wherein said seal ring further comprises a cavity axially aligned with said central bore and extending from said third end region to said fourth end region, wherein said third end region comprises an inner diameter substantially corresponding to an inner diameter of said first central bore proximate said second end region.

57. (Withdrawn) The nozzle tip of claim 56 wherein said substantially radially planar weld junction extends from said exterior surfaces of said seal ring and said tip retainer to an inner surface of said cavity and said central bore.

58. (CURRENTLY AMENDED) A nozzle tip₁ comprising:

a tip retainer₁ comprising:

a first end region;

a second end region comprising a substantially radially planar distal most end face; and

a central bore extending between said first and said second end regions; and

a seal ring comprising a third end region having a substantially radially planar distal most end face welded to said substantially radially planar distal most end face of said tip retainer and a fourth end region disposed generally opposite said third end region, wherein said seal ring comprises a material having a lower thermal conductivity than said tip retainer; and

a tip insert axially received in said central bore of said tip retainer, said tip insert further comprising a shank end, a tip end having an outlet aperture, and an external annular step extending generally radially outwardly from an exterior surface of said shank end that substantially abuts against an internal annular step extending generally radially inwardly from said central bore proximate said second end region of said tip retainer, wherein said internal and said external annular steps comprise a stop shoulder that limits axial movement of said tip insert from said first end region towards said second end region of said tip retainer.

59. (PREVIOUSLY PRESENTED) The nozzle tip of claim 58 wherein said third end region comprises an exterior surface having an outer perimeter substantially corresponding to an outer perimeter of an exterior surface of said second end region at said weld.

60. (PREVIOUSLY PRESENTED) The nozzle tip of claim 59 wherein said seal ring further comprises a cavity axially aligned with said central bore and extending from said third end region to said fourth end region of said seal ring, wherein said third end region comprises an inner diameter substantially corresponding to an inner diameter of said second end region of said central bore proximate said weld.

61. (Previously Presented) The nozzle tip of claim 60 wherein said weld extends substantially radially inwardly along said substantially radially planar distal most end faces of said tip retainer and said seal ring from said exterior surfaces of said seal ring and said tip retainer to an inner surface of said cavity and said central bore.

62. (PREVIOUSLY PRESENTED) The nozzle tip of claim 5869 wherein said fourth end region of said seal ring further comprises a generally frustoconical outer surface having a maximum diameter a distal most end of said fourth end region.

63. (CURRENTLY AMENDED) The nozzle tip of claim 59 wherein said exterior surface of said tip retainer further comprises a circumferential groove disposed a spaced distance from said substantially radially planar distal most end face of said second end region, ~~wherein a portion of a heater is disposed within said circumferential groove and about said exterior surface of said first end region of said tip retainer.~~

64. (CANCELLED).

65. (CURRENTLY AMENDED) A nozzle tip₁ comprising:

- a tip retainer comprising a first central bore extending between a first and a second end region wherein said second end region comprises a substantially radially planar distal most end face; and

- a seal ring comprising a material having a lower thermal conductivity than said tip retainer, said seal ring further comprising:

- a third end region having a substantially radially planar distal most end face welded to said substantially radially planar distal most end face of said tip retainer;

- a fourth end region having a generally frustoconical exterior surface having a maximum diameter a distal most end of said fourth end region; ~~and~~

- a second central bore extending between said third and said fourth end regions, said second central bore having an

inner diameter at said third end region substantially corresponding to an inner diameter of said second end region of said first central bore; and

a tip insert axially received in said first central bore of said tip retainer, said tip insert further comprising a shank end, a tip end, and an external annular step extending generally radially outwardly from an exterior surface of said shank end that substantially abuts against an internal annular step extending generally radially inwardly from said second end region of said first central bore, wherein said internal and said external annular steps comprise a stop shoulder that limits axial movement of said tip insert from said first end region towards said second end region of said tip retainer.

66. (PREVIOUSLY PRESENTED) The nozzle tip of claim 65 wherein said tip retainer comprises a steel material and said seal ring comprises a copper alloy material.

67. (PREVIOUSLY PRESENTED) The nozzle tip of claim 65 wherein said third end region of said seal ring comprises an exterior surface having a perimeter substantially corresponding to a perimeter of an exterior surface of said second end region of said tip retainer proximate said weld.

68. (PREVIOUSLY PRESENTED) The nozzle tip of claim 67 wherein said weld extends substantially radially inwardly from said exterior surfaces of said seal ring and said tip retainer to an inner surface of said first and said second central bores along said substantially radially planar distal most end faces.

69. (CANCELLED).

70. (CURRENTLY AMENDED) A nozzle tip₁ comprising:

a tip retainer₁ comprising:

a first end region;

a second end region comprising a substantially radially planar distal most end face; and

a central bore extending between said first and said second end regions;

a seal ring comprising a third end region having a substantially radially planar distal most end face welded to said substantially radially planar distal most end face of said tip retainer and a fourth end region disposed generally opposite said third end region, wherein said seal ring comprises a material having a lower thermal conductivity than said tip retainer; and

a tip insert axially received in said central bore of said tip retainer, said tip insert further comprising a shank end, a tip end having an outlet aperture, and an external annular step extending generally radially outwardly from an exterior surface of said shank end that substantially abuts against an internal annular step extending generally radially inwardly from said central bore at said second end region of said tip retainer, wherein said internal and said external annular steps comprise a stop shoulder that limits axial movement of said tip insert from said first end region towards said second end region of said tip retainer.

71. (CURRENTLY AMENDED) A nozzle tip₁ comprising:

a tip retainer comprising a first central bore extending between a first and a second end region wherein said second end region comprises a substantially radially planar distal most end face; and

a seal ring comprising a material having a lower thermal conductivity than said tip retainer, said seal ring further comprising:

a third end region having a substantially radially planar distal most end face welded to said substantially radially planar distal most end face of said tip retainer;

a fourth end region having a generally frustoconical exterior surface having a maximum diameter substantially at a distal most end of said fourth end region; ~~and~~

a second central bore extending between said third and said fourth end regions, said second central bore having an inner diameter at said third end region substantially corresponding to an inner diameter of said second end region of said first central bore; and

a tip insert axially received in said first central bore of said tip retainer, said tip insert further comprising a shank end, a tip end, and an external annular step extending generally radially outwardly from an exterior surface of said shank end that substantially abuts against an internal annular step extending generally radially inwardly from said second end region of said first central bore, wherein said internal and said external annular steps comprise a stop shoulder that limits axial movement of said tip insert from said first end region towards said second end region of said tip retainer.

72. (NEW) An injection molding nozzle, comprising:

a thermal gate configuration, including:

an elongated nozzle housing having a melt channel therethrough being configured to be in fluid communication with a pressurized molten material; and

a nozzle tip being installed at a proximal end of the elongated nozzle housing, the nozzle tip forming a tip channel, the tip channel being in fluid communication with the melt channel, and the nozzle tip having an outlet aperture being in fluid communication with the tip channel, the nozzle tip including:

a tip retainer;

a tip insert being retained at the proximal end of the elongated nozzle housing by the tip retainer, the tip retainer being removably affixed to the proximal end of the elongated nozzle housing, the tip retainer being configured to receive and retain the tip insert to the proximal end of the elongated nozzle housing, and the tip channel and the outlet aperture being in the tip insert; and

a heater being installed over the elongated nozzle housing and the tip retainer, the heater being configured to supply heat to the elongated nozzle housing and the tip retainer to keep the pressurized molten material being located in the melt channel and the tip channel molten, and during operation of the injection molding nozzle, the heater heats the elongated nozzle housing and the tip retainer so that heat is transferred to the pressurized molten material being located in the melt channel and the tip channel;

the tip retainer having a seal ring portion, the seal ring portion being configured to seat into and seal against a portion of a mold to prevent the pressurized molten material from becoming ejected from the outlet aperture and from leaking

therefrom, the seal ring portion being fused to a retaining portion of the tip retainer, the seal ring portion being made of a material having lower thermal conductivity than the retaining portion so that: (i) heat transfer from the tip retainer to a cold mold through the seal ring portion being minimized, and (ii) heat transfer from the heater through the tip retainer to the pressurized molten material in the tip channel being maximized.

73. (NEW) The injection molding nozzle of claim 72, wherein:

fusing of the seal ring portion with the retaining portion is done at junction, the junction oriented substantially radially, and the junction has an inside exposed to an injection pressure in the pressurized molten material, the inside of the junction fused so that the pressurized molten material is not allowed to penetrate into the junction.

74. (NEW) An injection molding nozzle, comprising:

a valve gate configuration, including:

an elongated nozzle housing having a melt channel therethrough being configured to be in fluid communication with a pressurized molten material; and

a nozzle tip being installed at a proximal end of the elongated nozzle housing, the nozzle tip forming a tip channel, the tip channel being in fluid communication with the melt channel, the nozzle tip having an outlet aperture in fluid communication with the tip channel, the nozzle tip including:

a valve stem having an end;

a valve gate tip forming the tip channel and the outlet aperture, the valve gate tip being connected with the proximal end of the elongated nozzle housing, and the valve gate tip receiving the valve stem in the outlet aperture, the valve gate tip being configured to reciprocate axially to start and stop a flow of the pressurized molten material through the outlet aperture; and

a heater being installed over the elongated nozzle housing and the valve gate tip, the heater being configured to supply heat to the elongated nozzle housing and the valve gate tip to keep the pressurized molten material in the melt channel and the tip channel molten, and during operation of the injection molding nozzle, the heater heats the elongated nozzle housing and the valve gate tip which transfer heat to the pressurized molten material in the melt channel and the tip channel;

the valve gate tip having a cap portion, the cap portion being configured to seat into and seal against a portion of a mold to prevent the pressurized molten material from becoming ejected from the outlet aperture and from leaking therefrom, the cap portion being fused to a tip portion of the valve gate tip, the cap portion being made of a material having a lower thermal conductivity than the tip portion so that: (i) heat transfer from the valve gate tip to a cold mold through the cap portion being minimized, and (ii) heat transfer from the heater through the valve gate tip to the pressurized molten material in the tip channel being maximized.

75. (NEW) The injection molding nozzle of claim 74, wherein:

fusing of the cap portion with the tip portion is done at junction, the junction oriented substantially radially, and the junction has an inside exposed to an injection pressure in the pressurized molten material, the inside of the junction fused so that the pressurized molten material is not allowed to penetrate into the junction.